

DOCUMENT RESUME

ED 222 696

CE 034 097

AUTHOR Hills, Stephen M.
TITLE How Craftsmen Learn Their Skills: A Longitudinal Analysis.
INSTITUTION Ohio State Univ., Columbus. Center for Human Resource Research.
SPONS AGENCY National Inst. of Education (ED), Washington, DC.
PUB DATE Nov 81
NOTE 50p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Comparative Analysis; *Craft Workers; Educational Benefits; *Job Skills; *Job Training; Longitudinal Studies; *On the Job Training; Outcomes of Education; Participation; Postsecondary Education; Racial Factors; Salary Wage Differentials; Secondary Education; *Skill Development

IDENTIFIERS *Formal Education; *Informal Education; National Longitudinal Surveys

ABSTRACT

A longitudinal study examined the processes by which craftsmen acquire the skills required for their jobs. Using data from the young men's cohort of the National Longitudinal Surveys, researchers examined the job training obtained by a sample of 1,525 young men between the years 1966 and 1976. Among the areas addressed were the following: the importance of informal on-the-job training, the ways in which those who receive no formal training acquire their skills, the comparative economic benefits of formal and informal training, and the existence of any significant racial differences in the training process and its outcomes. The study revealed that even in crafts occupations a substantial proportion of young men obtain their skills through informal methods. In fact, over 40 percent of those holding crafts positions did not participate in skilled, manual training programs, and an additional 30 percent received some sort of on-the-job training. Formal training does, nevertheless, yield a substantial wage benefit for those who obtain it. Fewer black craftsmen received formal training than did their white counterparts. Furthermore, blacks were less apt to have apprenticeship or other formal training offered through employers. Recommendations called for continued support for training methods that compensate for blacks' low participation in apprenticeship programs. (MN)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

ED2222696

How Craftsmen Learn Their Skills:
A Longitudinal Analysis

Stephen M. Hills
Center for Human Resource Research

November, 1981

My thanks to Mark Bills whose excellent assistance and constant critique enhanced this research considerably. My thanks also to Mary Ann Harmon and Sherry Stoneman McNamara for their superior technical work in completing the project. This paper was prepared under a contract with the National Institute of Education. Researchers undertaking such projects under Government sponsorship are encouraged to express their own judgements. Interpretations or viewpoints contained in this document do not necessarily represent the official position or policy of the National Institute of Education.

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

✓ This document has been reproduced as
received from the person or organization
originating it.

☐ Minor changes have been made to improve
reproduction quality.

• Points of view or opinions stated in this docu-
ment do not necessarily represent official NIE
position or policy.

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

S Hills

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

Too little is known about the process of skill acquisition for jobs in the U.S. This study examines the training of craftsmen, a group who by definition have attained skilled training for their jobs. Skilled craftsmen acquire training in a number of ways, both formal and informal. Classified as formal training are the vocational education programs provided by high schools, technical institutes, and junior colleges. Also included are government training programs, company training other than on-the-job, and apprenticeships. All other methods are customarily defined as informal.

Our study provides a picture of the training process: when it occurred, from what sources, and to what degree it was formal or informal. We expected to find that skilled craftsmen received more of their training formally than young men who worked in other occupations. Among the questions we address are these: How important is informal, on-the-job training for skilled craftsmen? What inferences can we make about the way those who receive no formal training acquire their skills? Does informal training yield economic benefits as high as the benefits from formal training? What proportion of the sample received skilled manual or vocational training but did not ultimately find employment as craftsmen? What kind of work did they do instead? Are there significant racial differences in the training process and its outcomes?

Previous Research

The lack of attention to the training of highly skilled

workers in part reflects the shift in the federal government's policy priorities between the early 1960s and the present. A concern for highly skilled workers gave impetus to the growth in spending for federal employment and training programs initiated in the 1960s. Automation and presumed skill bottlenecks in the economy were two important rationales for passage of the Manpower Development and Training Act of 1962. Subsequently, emphasis shifted from skilled workers of all age groups to unskilled workers who were young or in poverty, and providing entry level jobs or basic skills became major objectives of federal employment and training policy in the mid 1960s and 1970s. Now the federal government's emphasis has shifted again to revitalization of the economy while labor leaders express renewed concern over threatened economic dislocations that stem from shifting trade patterns and capital flows. These changes may bring about a revival of interest in skills acquisition and technical training.

One of the earliest research projects funded by MDTA was undertaken by the Bureau of Labor Statistics (BLS). Through a supplement to the April 1963 Current Population Survey, the BLS asked respondents to report retrospectively on how they had been trained for their jobs.¹ Before 1963, such a nationwide survey of workers' preparation for jobs had not been done.

The BLS survey yielded a wealth of descriptive information

¹See U.S. Department of Labor, Manpower Administration, Formal Occupational Training of Adult Workers, Manpower Research Monograph No. 2, Washington, D.C.: U.S. Government Printing Office, December 1964.

on training in the early 1960s. For example, 51 percent of male workers age 22-34 with less than three years of college had taken formal job training,² and about one-half of these were using their training on their current or last job. Over half of men of all ages who had received no training reported that they had acquired skills informally on the job. Those who had no training also had the least education: more than half had eight years or less of schooling.

BLS researchers demonstrated a close relationship between job training and the level of education. They suggested that though schools offered the best prospects for expanding vocational training, strong emphasis should also be placed on alternative ways of providing training to school dropouts, who needed it most. BLS researchers also found that workers with less than eight years of schooling but some vocational training had significantly lower unemployment rates than those with no training, further underscoring the need to direct special training efforts at school dropouts.

This study extends and updates research initiated by the BLS in 1963. We restrict the analysis to men whose jobs require significant skills, those working in the various crafts. Using a longitudinal file of information on employment and training, we have built a record of skill acquisition for a national sample of young men who had training in the late 1960s and early 1970s and who ultimately became craftsmen.

²Ibid., Table 1, p. 34. Women had more training than men, 57 percent of those 22-34 with less than 3 years of college.

The Data

Data for the study were obtained from the young men's cohort of the National Longitudinal Surveys (NLS). Between 1966 and 1976, the NLS fielded nine interviews with a sample originally numbering 5,000 men. Annual personal interviews were conducted from 1966-1971, telephone interviews in 1973 and 1975, and another personal interview in 1976.³ In each interview information on training was updated. Given the sporadic nature of training, this longitudinal file has very significant advantages over single surveys, which rely on recall to obtain information retrospectively. If we were to analyze a cross section of young men drawn from 1976, we would count as craftsmen only those who had persisted in their trades and who were thus least affected by the recessionary conditions in 1975 and 1976. We avoid this form of selection bias by selecting all those who were craftsmen at any time since leaving school. Our sample then, consists of 1,525 young men who at age 24-34 had worked as skilled craftsmen at some time since leaving school, 1,152 whites and 373 blacks.⁴ The men were on average 26 years old and had 8

³The National Longitudinal Surveys have been funded by the U.S. Department of Labor since the mid-1960s. Surveys are developed at the Center for Human Resource Research, Ohio State University. The surveys now consist of five separate cohorts: men and women who were age 14-24 in the mid-1960s, women who were 40-54 and men who were 45-59 at that time, and a new cohort of young men and women who were age 14-21 in 1979. For more information on the NLS see the NLS Handbook, Center for Human Resource Research, Ohio State University, revised 1981.

⁴The definition of craftsman is based on an occupational coding. In the NLS, jobs are assigned 3-digit Census occupational codes. From a young man's post-school employment history, we checked the occupational codes for his current or

years of post-school labor market experience. Men with 7-10 years of labor market experience had completed their training in an average 4-5 years after leaving school. The overwhelming majority had accumulated less than three years of college by the time they left school, but approximately 8 percent of the whites and 2 percent of the blacks had fifteen or more years of regular schooling. Seventy-four percent of the craftsmen were high school graduates.

Incidence of Formal Training

Due to the skilled nature of the jobs that craftsmen held, we expected an incidence of formal training somewhat higher than for all young men. To test this expectation, we selected a subset of craftsmen age 24-34 and compared them with men of the same age who had never become craftsmen. For both groups, we selected those with less than three years of college, in order to exclude those whose jobs required more education than crafts occupations require. We found that craftsmen did, indeed, receive significantly more formal training than their counterparts who did not become craftsmen. A little more than two-thirds of white craftsmen age 26-31 had received some form of skilled manual training. Less than half of similarly aged whites

Last job in each survey year. If multiple jobs were held in a survey year, we also checked the longest job held. A young man was considered a craftsman if any of these jobs was coded as a crafts occupation. This is a liberal definition which includes those who worked for relatively short periods of time as craftsmen. Since no restriction was placed on the amount of income earned or the amount of time worked in a crafts occupation, our definition includes young men who worked for relatively short periods of time as craftsmen.

Table 1 Proportions of Men Who Received Skilled Manual Training, Craftsmen and Non-Craftsmen

(Weighted percentages)¹

Age	Skilled craftsmen		Non-craftsmen	
	Frequency	% with any formal training	Frequency	% with any formal training
<u>Whites</u>				
24-25	206	61.9	243	37.4
26-28	267	66.0	266	44.3
29-31	149	69.4	138	44.1
32-34	130	72.4	196	40.1
<u>Blacks</u>				
24-25	90	54.2	134	38.7
26-28	64	59.6	142	37.2
29-31	48	60.8	85	29.3
32-34	25	58.0	65	35.3

UNIVERSE: Men who were 24-34 when last worked as craftsmen or men who were 24-34 in 1976 and had never been craftsmen. All had less than three years of college and were interviewed in 1976. Craftsmen were those who ever were in a crafts occupation (current or last job at each interview) since the first time they left school.

¹All descriptive statistics are weighted to produce national population estimates. The weights adjust for differential rates of attrition over time among sub-groups of the original sample surveyed in 1966. The actual sample sizes on which the weighted population estimates are based are shown in the columns labeled "frequency." This convention will be followed throughout the paper.

who never became craftsmen had skilled manual training. These relationships were similar for blacks (see Table 1).

Secular Changes in Training

Crafts training may be had in a number of settings. We enumerated the sources of training for all young men surveyed in 1976 by the NLS and compared our data with the earlier BLS study. Table 2 shows the extent of training for all men surveyed as well as the sources of training. Though our definitions of training may not correspond exactly with those used in the earlier BLS study, we can observe important changes in both the extent and kind of training young men receive.⁵

The amount of training men receive rose sharply during the period 1963 to 1976. Table 2 shows that only 46 percent of men 22-64 years old had received training by 1963, compared with more than 70 percent for the full NLS sample of young men by 1976. Even if the BLS sample is restricted to men age 22-34, a sample more comparable in age to the NLS respondents, only 51 percent reported prior training in 1963.

The sources of training have shifted considerably over time. In 1963 most training took place in educational institutions; thirty percent of the training programs were offered through high schools. By the mid-1970s, however, only 12 percent of the training programs young men reported were offered

⁵In our study of craftsmen, we will define formal training to include only skilled manual training. For comparison with the BLS we include all kinds of training.

Table 2 Training by Source for NLS and BLS Surveys
(Weighted percentages)

	NLS whites, 1976 24-34 years old		NLS blacks, 1976 24-34 years old		BLS study, 1963 all persons 22- 64 years old
	# of in- dividuals with training ¹	% of total in- dividuals	# of in- dividuals with training ¹	% of total in- dividuals	% of total individuals
Any training - civilian or military	1682	76.0	654	56.5	46.1
Total		100		100	
	# of programs reported	% of total programs	# of programs reported	% of total programs	% of total programs
Military	536	16.5	116	12.1	16.2
Civilian					
High school	394	11.4	218	17.5	29.5
Junior or community college	228	8.1	59	8.9	3.8
Business college or technical inst.	482	15.1	164	15.7	23.6
Correspondence course	204	7.0	25	3.3	7.7
Apprenticeship	216	9.1	92	7.9	11.7
Company training	118	16.6	158	15.0	7.5
Other civilian	474	16.3	205	19.7	0.1
Total programs		100		100	100

UNIVERSE: Men with less than three years of college.

¹Unweighted sample sizes from the NLS. See note 1 in Table 1.

through high schools. Sources of training which showed the most rapid growth were company training, whose share of the total grew from 8 percent to 16 percent, and "other civilian training," a category which includes government training such as CETA. The growth in this category for blacks was particularly large, accounting for 20 percent of the programs blacks reported in 1976.

In 1976 blacks were more similar to respondents from the 1963 survey insofar as one of their most important sources of training was the high school. Blacks reported that 18 percent of their training programs originated in high school. Blacks received less of their training through the military; but, interestingly, little difference was reflected in the proportions of blacks and whites reporting company training or apprenticeships. A smaller proportion of all blacks were participating in either of these latter two types of training, since only 57 percent of all black men reported any training, compared with 76 percent of white men. A significant gap between black and white rates of training remained in 1976 despite the secular increase in the amount of training blacks received. The 1963 study reported 37 percent of blacks age 22-34 with some form of training compared to 51 percent for men of both races. The more recent NLS data show that 57 percent of black young men received training compared to 74 percent for both blacks and whites.

The training for skilled crafts provides an interesting contrast to the training experience of all young men. For all

young men, informal methods of training were important in the skills acquisition process, despite the secular increase in training. For craftsmen, informal training was even more important. Forty-one percent of whites and 45 percent of blacks had received only informal training prior to the time we found them at work as craftsmen (Table 3).⁶

The sources of training for craftsmen differed considerably from the sample we drew of all young men. For craftsmen, both apprenticeships and company training play a prominent role, at least for whites. Together, these two kinds of training programs represented about 38 percent of the programs reported by craftsmen who had training, but among the full sample of young men these two types of training accounted for only one-fourth of all programs taken.

For black craftsmen, the apprenticeship route was not nearly as important as high school or other training. Sharp differences also existed by race in the amount of skilled training received

⁶Measures of informal training, however, are not completely comparable between the sample of all young men (craftsmen and non-craftsmen) and the sample of craftsmen. The craftsmen are younger, ranging in age from 16-34, since we identify them at any time since they left school. The full cross-section of young men was drawn from 1976 when they were ages 24-34 only. As the craftsmen age, they may obtain more training. For example, we calculated the proportions of craftsmen who received only informal training and whose ages were more than the median age of 26. We found that formal training grew in importance for the older craftsmen. Of the whites, 68 percent of the older craftsmen had had formal training whereas the comparable statistic for the younger craftsmen was only 52 percent. Of the older blacks, 61 percent had had formal training compared to 51 percent for the younger blacks. A second difference exists in the definition of formal training. For the 1976 cross-section of men, we counted all training sources. For craftsmen, we counted only skilled manual training.

Table 3 Skilled Manual Training by Source, for NLS Craftsmen
(Weighted percentages)

	Whites		Blacks	
	# of in- dividuals with training	% of total in- dividuals	# of in- dividuals with training	% of total in- dividuals
Total		100		100
Any training	666	58.6	194	55.0
School training	315	27.6	89	25.8
Job training	345	31.3	77	20.5
	# of programs reported	% of total programs	# of programs reported	% of total programs
Military	140	13.0	23	9.3
Civilian				
High school	190	16.1	65	22.9
Junior or community college	58	5.1	19	7.2
Business college or technical institute	119	11.6	26	9.2
Apprenticeship	214	19.6	42	13.9
Company training	196	18.5	44	15.1
Other skilled, manual training	167	15.7	61	22.3
Total programs		100		100

UNIVERSE: Young men who were craftsmen at some time between leaving school and attaining ages 24-34. All training measures were taken in the last year that we found them craftsmen.

through the military, where blacks received much less training than whites.

Two questions are raised by these initial results. First, Who are the two-fifths of the young men who report no training and yet are employed in occupations requiring very specific skills? How did they learn these skills? Second, What do racial differences in training imply about the structure of jobs for blacks in the various crafts?

Sources of Informal Training

The bulk of craftsmen were working in either construction or manufacturing, these two industries accounting for about 60 percent of craftsmen (Table 4). Informal training characterizes the construction industry: craftsmen here were most likely to learn their skills informally, and apprenticeships are also more common in construction than in other industries (Table 5). Apprenticeships institutionalize the process, but a large number of workers pick up skills on their own or through informal apprenticeships.

An analysis of separate crafts shows that informal training was most likely to be acquired by painters, roofers, road machine operators, printers, and various kinds of inspectors (Table 6). Other crafts rely much more heavily on formal training, but in none does the proportion come close to 100 percent. Crafts which rely most heavily on formal training are electricians and linemen, but even in these occupations fully one-quarter of the young men reported no formal training.

Table 4 Degree of Formal Training for Craftsmen by Industry
(Weighted percentages)

Industry	Whites		Blacks	
	Freq. (% of total)	% with any formal training	Freq. (% of total)	% with any formal training
All	1131 (100)	58.6	366 (100)	54.4
Construction	364 (32.2)	49.4	96 (26.2)	49.4
Manufacturing	319 (28.2)	63.4	133 (36.3)	55.8
Wholesale and retail trade	160 (14.1)	67.3	43 (11.7)	45.9
Business and repair services	106 (9.4)	57.2	30 (8.2)	68.3
Transportation, communication, and other public utilities	89 (7.9)	69.0	28 (7.7)	70.3
Other	93 (8.2)	56.3	36 (9.8)	48.5

UNIVERSE: Same as Table 3 except that 21 whites and 7 blacks are NA for industry.

Table 5 Training Participation of Craftsmen by Type of Training, in
Construction, Manufacturing or Other Industry

(Weighted percentages)

	Whites		
	Construction (n = 364)	Manufacturing (n = 319)	Other (n = 448)
% with apprentice training	20.5	23.3	15.2
% with company training, but no apprentice training	4.6	12.1	18.4
% with only training other than apprentice or company training	24.4	28.0	29.3
% with no training	50.6	36.6	37.1
Total	100.0	100.0	100.0
	Blacks		
	Construction (n = 96)	Manufacturing (n = 133)	Other (n = 137)
% with apprentice training	15.9	5.8	12.0
% with company training, but no apprentice training	2.5	11.0	13.9
% with only training other than apprentice or company training	31.1	38.9	30.5
% with no training	50.5	44.2	43.6
Total	100.0	100.0	100.0

UNIVERSE: Same as Table 4.

Table 6 Degree of Formal Training Among Craftsmen by Occupation
(Weighted percentages)

	Whites		Blacks	
	Freq.	% with formal training	Freq.	% with formal training
All	1152	58.5	373	55.0
Carpenters and cabinet makers	156	46.7	29	55.1
Painters	45	28.4	31	40.1
Electricians	51	74.3	14	76.1
Plumbers	45	61.0	10	69.3
Roofers	23	30.8	6	56.0
Other construction workers	31	46.7	28	48.5
Inspectors	28	32.7	11	33.5
Mechanics and repairmen	416	64.9	123	55.5
Machine operators	99	69.5	32	63.8
Road machine operators	56	40.5	21	26.2
Metal workers	59	70.1	18	76.1
Linemen	52	77.0	12	91.7
Type setters, engravers, printers	34	41.2	7	41.6
Miscellaneous	57	59.3	31	44.0

UNIVERSE: Young men who were craftsmen at some time between leaving school and attaining ages 24-34. All training measures were taken in the last year that we found them craftsmen.

Given the unionized nature of many formal apprenticeship programs, young men who enter the crafts through an informal process of training should be more likely to work in non-union jobs. In construction this is certainly true (Table 7). But for blacks in manufacturing lack of formal training per se does not seem to be a barrier to employment in the unionized sector. Blacks in union jobs are just as apt to be trained informally as blacks in non-union jobs.

Few other clues could be found about how informal training is meted out. Several hypotheses were explored to explain differences between respondents who chose informal training versus formal training prior to working as craftsmen. We wondered whether a father who was a craftsman could have passed skills on to his son, thereby eliminating the need for formal training. A fifth of those trained informally did indeed have fathers who were craftsmen, but even more of those trained formally were second generation craftsmen (Table 8). Those trained informally had about the same IQs and levels of education as those formally trained. Whites trained informally were somewhat younger and had less labor market experience since leaving school; they were also more apt to have come from rural areas. We examined the distribution of jobs young men held immediately after leaving school, hypothesizing that craftsmen trained informally may have acquired skills previously in other occupations and then transferred them to the crafts. Occupational distributions in the first job after leaving school were very similar between those trained formally and informally,

Table 7 Degree of Formal Training by Union Status
(Weighted percentages)

Industry	Whites		Blacks	
	Freq. (% of total)	% with any formal training	Freq. (% of total)	% with any formal training
Construction	226		45	
Union	88 (38.9)	71.7	7 (15.6)	88.2
Non-union	138 (61.1)	47.9	38 (84.4)	46.0
Manufacturing	203		63	
Union	93 (45.8)	75.0	43 (58.9)	62.9
Non-union	110 (54.2)	58.5	30 (41.1)	63.5
Other industries	293		86	
Union	87 (29.7)	78.2	17 (19.8)	65.6
Non-union	206 (70.3)	61.4	69 (80.2)	57.0

UNIVERSE: 1) Young men who were craftsmen at some time between leaving school and attaining ages 24-34, and 2) who were employed in 1969, 1970, 1971 or 1976. Training measures were obtained in the last year that they were craftsmen. Union status was assigned for the last year that we found them employed.

Table 8 Characteristics of Skilled Craftsmen by Receipt of Formal Training
(Standard deviations in parentheses)

	Whites (Sample size = 1152)		Blacks (Sample size = 373)	
	With training	No training	With training	No training
Sample size (percent)	666 (57.8)	486 (42.2)	194 (52.0)	179 (48.0)
<u>Characteristics</u>				
Mean # of years since left school	9.1 (3.95)	7.5 (4.68)	8.5 (4.26)	8.4 (4.98)
% who at age 14 had a skilled craftsman father (or head of household)	26.9 (.44)	21.5 (.41)	10.1 (.30)	7.7 (.27)
Mean age	26.8 (3.84)	25.3 (3.99)	26.0 (4.31)	25.6 (4.19)
Mean IQ ¹	100.4 (10.6)	101.0 (11.8)	86.1 (11.1)	85.3 (8.9)
Mean education	11.9 (1.6)	11.9 (2.5)	11.4 (1.8)	10.6 (2.4)
Percent rural	29.7	31.1	34.7	33.1
Percent whose first job after school was:				
Professional, technical or kindred	2.1	1.6	0.0	1.4
Farm laborer or farm foreman	3.6	3.4	5.2	6.0

¹Sample sizes were reduced to 812 whites and 159 blacks for IQ measures. Of the whites in the reduced sample 61 percent had training; of the blacks, 57 percent.

UNIVERSE: Same as Table 3.

with one exception: blacks trained informally were more likely to have had a job in farming after leaving school than were those who were trained formally. This finding lends some support to the notion that farming allows one to pick up a number of skills useful in the crafts. Both blacks and whites with informal training were also more likely to have worked as professional, technical, and kindred workers immediately after leaving school, a finding which supports the transfer of training hypothesis as well. These differences are relatively small, nevertheless, and do not go far in explaining the amount of informal training for craftsmen.

On the whole, few traces of the process of informal skill acquisition remain in the longitudinal record for us to identify. Clearly, a significant proportion of respondents were not excluded from craftsmen positions because of lack of formal training alone. Even for crafts which rely heavily on formal training, as many as one-fourth are found employed as craftsmen but report no prior formal training.

Racial Differences in the Structure of Training

The skills acquisition process for blacks is quite different than for whites. Table 1 showed that participation in apprenticeship programs differed little by race, but when we select only men who succeed in finding skilled crafts positions, the differences are great. In the late 1960s and early 1970s much lower proportions of blacks than whites entered the crafts through formal apprenticeships (Table 5). In the construction

industry, blacks compensated for their low rates of apprenticeship by higher rates of school or other training. In manufacturing, blacks received more "other civilian training" than whites, but not enough to account for the extremely large discrepancies between black and white apprenticeships. Much attention has been paid to the differential treatment of minorities in the construction industry, but these data show the problem to be much more severe in manufacturing. In the "all other industry" category, rates of apprenticeship differ less by race, but here, blacks received less company training. If formal training pays off, each of these racial differences could prove disadvantageous for black craftsmen.

Another significant racial difference exists in the degree of military training reported by blacks relative to whites (see Table 3). There are a number of explanations for this difference. First, a smaller proportion of blacks reported having served in the military by 1976; many of these had served prior to 1966, when disproportionate numbers of whites entered the military. Of those who did serve after 1966, attrition from the NLS data sample differentially eliminated more blacks than whites.

Differential rates of reported military service did not account for all differences in military training, nevertheless. If we select only those young men who report military service, considerably more of the whites received military training than did blacks (Table 9). One explanation for this finding is that blacks were more likely to be drafted into the army or the

Table 9 Degree of Training Received During Military Service by Branch, Enlistment Status, and Race

(Weighted percentages)

	Percentage who received training	Sample size
<u>Whites</u>		1176
In Army or Marines	20.2	775
Enlisted	21.5	521
Drafted	17.3	253
In Air Force, Navy, or Coast Guard	33.2	400
Enlisted	33.2	400
Drafted	0.0	0
<u>Blacks</u>		295
In Army or Marines	13.1	224
Enlisted	10.8	96
Drafted	15.0	128
In Air Force, Navy, or Coast Guard	25.0	70
Enlisted	25.7	67
Drafted	0.0	3

UNIVERSE: All young men who reported service in the military in 1966, 1969, 1971, or 1976.

marines whereas enlistees in the air force, navy, or coast guard were more likely to have received skilled training. In fact white and black draftees did receive the same amount of training, but far more white enlistees than black received training during this period. White enlistees may have been more qualified for training than blacks (more highly educated, for instance); furthermore, blacks who were trained may have been more likely to re-enlist in the military and thus never reinterviewed in the NLS sample. Our data cannot determine which, if either, of these possibilities is true. The data do show that blacks with military training had difficulty transferring their training to the civilian sector. Only 4 percent of the blacks who had skilled manual training in the military reported using it in employment subsequent to military service, but 20 percent of the whites made use of their military training.⁷

In summary, if formal training provides an economic return for craftsmen, then blacks are put at a disadvantage in a number of ways. Entrance to the crafts for blacks is more likely to come through informal training, reflecting in part the very low rate of participation in apprenticeships relative to whites. In manufacturing, higher rates of participation in company or other training only partially offsets the extremely low rates of black apprenticeships in this sector. Military training, which could

⁷"Subsequent employment" is the job held in the first interview after returning from the military. If blacks have more difficulty in making a transition from the military to the civilian sector, it is possible that blacks will ultimately find crafts jobs and the difference between blacks and whites would therefore narrow.

serve to offset some of the black disadvantage was not transferred to the civilian sector as readily for blacks as for whites.

Skilled Manual Training for Non-Craftsmen

The large number of blacks who reported little use of their military training raises the question, What are the occupations young men accept if their skilled manual training is not applied to the crafts? For all non-craftsmen who had received skilled manual training before 1976 the NLS contains data on the longest job held in the previous five year period. We examined the occupational distribution of these jobs by race and found that 33 percent of white non-craftsmen could be labeled upwardly mobile. Rather than use their skilled manual training in the crafts, these men progressed to professional or technical jobs or obtained positions as managers, proprietors or foremen. Another 30 percent of whites obtained positions as operatives rather than craftsmen.⁸ The remaining one-third of the whites were scattered across occupations where skilled manual training would appear to be of little help--laborers, or service, clerical, or sales workers (Table 10).

Much less upward mobility can be inferred for blacks: only 10 percent of those with skilled manual training ultimately got jobs as professional or technical workers or as managers, proprietors or foremen. Forty-three percent were employed as operatives, and another 40 percent had relatively unskilled jobs

⁸A number of the operative positions could of course require skilled manual training.

Table 10 Percentage Distribution of Longest Job in Last Five Years for Non-Craftsmen in 1976 Who Received Skilled Manual Training

	<u>Whites</u>		<u>Blacks</u>	
	Freq.	Occ. class as % of training	Freq.	Occ. class as % of training
All	421	100	161	100
Professional, technical, and kindred workers	76	18.0	11	7
Managers, officials, and proprietors	50	12.8	5	3
Clerical workers	31	7.2	12	7
Sales workers	26	6.9	4	2
Craftsmen ¹	6	1.4	5	3
Foremen	13	2.6	1	1
Operatives	131	30.0	70	43
Service workers	33	8.5	20	12
Farmers, farm managers	14	3.6	1	1
Farm laborers and farm foremen	7	1.7	4	3
Laborers	28	6.4	26	16
Armed forces	6	0.8	2	1

UNIVERSE: Never a craftsman (as craftsman is defined in Table 3) and received some type of skilled manual training in school, in the military, or on the job.

¹Since the table is restricted to non-craftsmen, the 11 respondents who report craftsmen jobs indicate some degree of error in defining who were craftsmen. The work history from 1971-1976 is not complete and some respondents may be reporting a job held while still in school. Either may be the source of error.

as clerical, sales, or service workers or as laborers.

These data demonstrate again the difficulties blacks face in applying their formal training to jobs which utilize it. Given the lower probability of linking formal training with craftsmen positions, it is not surprising that a higher proportion of blacks enter the trades through informal routes.

Certain types of training may improve the probability that skilled training will be followed by crafts positions. For whites and blacks alike, company or apprenticeship training was more likely to insure craft employment, but even here the probabilities were not high: about 40 percent of whites and 54 percent of blacks with apprenticeship training did not become craftsmen (Table 11). Data not reported here show that about half of these could again be labeled upwardly mobile, i.e., they were drawn out of crafts occupations to work in occupations which would tend to be better in pay, responsibility or skill required. The other half were found employed as operatives, service workers, etc. where skills are less well utilized than in the crafts.

If apprenticeships have positive returns, greater emphasis on successful completion of apprenticeships and better incorporation of apprentices, particularly blacks, into the crafts should have pay-offs for business enterprises.

The Wage Rate Advantage for Craftsmen with Training

We now test whether or not training results in a positive wage differential for craftsmen. Many past studies have measured returns to training by analyzing individuals across the full

Table 11 Proportions of Young Men with Skilled Manual Training Who Became Craftsmen, by Source of Training

(Weighted percentages)

Source of training	Whites		Blacks	
	Freq.	% who became craftsmen	Freq.	% who became craftsmen
No training	1746	21.8	512	22.4
Any training	1071	51.9	335	45.0
Military training	255	46.5	42	44.1
Civilian training	934	55.3	313	44.7
School training	485	56.9	160	40.2
High school	305	53.9	110	35.7
Junior or community college	88	58.7	23	85.1
Business college or technical institute	162	66.6	54	39.5
Job training	445	62.7	113	50.0
Apprenticeship	281	60.7	54	46.2
Company training	227	71.4	66	55.9
Other training	265	53.8	111	50.3

UNIVERSE: All young men with skilled training, age 24-34 and interviewed by the NLS in 1976.

spectrum of occupations. To focus on any given subset of occupations like craftsmen creates sample selection problems since we do not always have a full record of the linkages among jobs, and the craftsman's occupation is particularly troublesome due to movement in and out of the crafts.⁹ A young man may prepare for a craftsman's job, work there for a time and then switch to something else: we have already observed the mobility of individuals who have gained skilled manual training but do not become craftsmen.

The traditional analysis based on a full cross section of occupations combines two effects: first, the direct effect of training on earnings in the job to which the training applies, and second, the indirect effect of training on mobility through a string of jobs related to the first job for which the training was directly applicable. Training in this second sense serves its most important purpose by helping the worker obtain his first good job, which leads to even better positions. By restricting our analysis to men who have ever been craftsmen, we measure only the return to training within one occupational group and omit any influence of training on mobility out of the crafts. We ask whether in this sense formal training is better than informal methods for acquiring skills and if so, what the relative advantage may be.

To establish a measure of wage advantage we use a standard human capital model with log wages expressed in 1976 dollars as

⁹A sample comprised of young men who have ever been craftsmen is more than twice as large as a sample of craftsmen drawn from 1976 alone.

the dependent variable. Independent variables are as shown in Table 12. Controls for education are non-linear due to the large number of respondents with twelve years of schooling. High school dropouts and those with some college are compared with those who hold a high school degree. We further controlled for IQ, using mean replacement of the race specific means to deal with missing data.¹⁰ Other personal characteristics controlled were veteran status, urban residence, race, residence in the South, and marital status. Control variables specific to the job or the job environment included industry variables (construction and "other industries" compared with manufacturing), variables controlling for a craftsman's self-employed status, each young man's job tenure and total work experience, the area unemployment rate as of 1970, and the year in which the young man was last a craftsman (i.e., the year in which wages were measured).¹¹

The results of a linear OLS estimation of the above wage model are shown in Table 12. Training is strongly significant: young men who enter a craft with formal training, other things equal, receive wages 10 percent higher than the wages of men without formal training.¹² The values for other estimated coefficients are reasonable and in the expected directions. Craftsmen in construction earn 7 percent more than in

¹⁰About 30 percent of the whites and 57 percent of the blacks had missing observations.

¹¹Dummy variables controlling for year when last a craftsman measure cyclical fluctuations in real earnings growth.

¹²This is calculated -1 where β is the estimated coefficient for the variable "any training" in Table 12.

Table 12 OLS Estimated Wage Equations for Craftsmen¹
 Dependent Variable: Ln of Hourly Rate of Pay in 1976 Dollars
 (t-values)

Independent variables	Column 1	Column 2	Column 3
Any training	.097 (4.88)		
Training hierarchy 1			
Apprentice training		.191 (6.91)	
Company training		.079 (2.43)	
Technical institute training		.042 (1.13)	
Other civilian training		.033 (0.99)	
Military training		.083 (1.75)	
High school training		.066 (1.71)	
No training		-	
Training hierarchy 2			
High school training			.090 (3.22)
Military training			.058 (1.45)
Other civilian training			.062 (1.95)
Technical institute training			.154 (3.97)
Company training			.100 (2.74)
Apprentice training			.156 (3.63)
No training			-
Dropout	-.113 (-4.67)	-.104 (-4.34)	-.109 (-4.51)
High school graduate	-	-	-
Attended college	.095 (3.59)	.096 (3.65)	.092 (3.48)
Years since left school	.0156 (4.76)	.0151 (4.62)	.0157 (4.79)
Veteran	.018 (0.88)	.022 (1.05)	.030 (1.32)
Tenure	.0167 (5.09)	.0171 (5.24)	.0166 (5.02)
SMSA	.130 (6.08)	.122 (5.73)	.131 (6.12)

Table 12 (continued)

Independent variables	Column 1	Column 2	Column 3
South	-.178 (-8.36)	-.177 (-8.36)	-.179 (-8.36)
Never married	-.159 (-6.51)	-.157 (-6.46)	-.160 (-6.53)
IQ	.0014 (1.52)	.0013 (1.41)	.0015 (1.60)
Owner	-.188 (-4.90)	-.184 (-4.83)	-.181 (-4.71)
Construction	.072 (2.79)	.067 (2.62)	.068 (2.63)
Manufacturing	-	-	-
Other industries	-.126 (-5.51)	-.123 (-5.36)	-.126 (-5.51)
1970 Census unemployment rate	.0019 (0.41)	.0014 (0.31)	.0021 (0.46)
Black	-.070 (-2.66)	-.065 (-2.50)	-.069 (-2.62)
Year = 1966	-	-	-
Year = 1967	.090 (1.43)	.095 (1.53)	.094 (1.50)
Year = 1968	.164 (2.55)	.174 (2.73)	.170 (2.65)
Year = 1969	.120 (1.88)	.127 (2.00)	.124 (1.94)
Year = 1970	.111 (2.02)	.115 (2.12)	.116 (2.13)
Year = 1971	.116 (2.28)	.114 (2.24)	.116 (2.28)
Year = 1973	.142 (2.89)	.147 (3.02)	.149 (3.03)
Year = 1975	.110 (2.21)	.113 (2.27)	.113 (2.26)
Year = 1976	.155 (3.19)	.160 (3.31)	.157 (3.23)
Constant	5.75 (52.43)	5.76 (52.88)	5.74 (52.20)
R ² (adjusted)	.362	.372	.364
F-ratio	34.2	29.4	28.4
S.E.E.	.341	.339	.341
Sample size	1345	1345	1345

¹This and all subsequent regressions have been estimated using unweighted data.

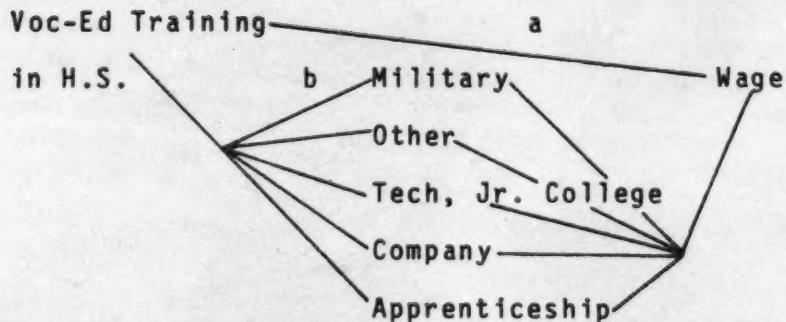
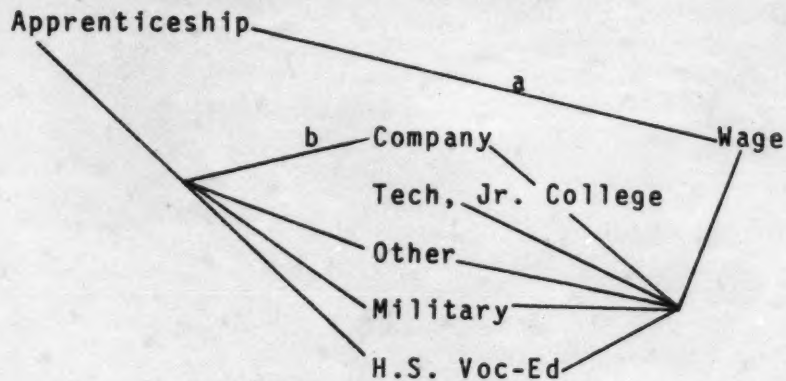
manufacturing, blacks earn 7 percent less than whites, and craftsmen living in the South earn 16 percent less than those in the North. Craftsmen in large urban areas (SMSAs), on the other hand, earn 14 percent more than those not in urban areas. Each additional year of labor market experience confers about the same benefit for craftsmen as each year of firm specific tenure, about a 1.6 percent increase in wages. Craftsmen with some college education earn about 10 percent more than high school graduates, whereas dropouts earn 11 percent less.

Economic benefits can also be measured according to the various types of training: apprenticeship, company training (other than apprenticeship), military training, vocational education while in high school, training acquired in a business college, junior college, or technical institute, and all other training, the latter including government sponsored training such as CETA.

If mutually exclusive patterns of training could be identified, the benefits attributed to training would be measured by estimating a linear regression model similar to the one shown in column 1 of Table 12. Substituting for the variable, "any training," would be a series of variables, representing mutually exclusive patterns of training methods. The subsequent earnings which corresponded with each of these patterns would then be compared with the earnings of individuals who had no training. If training patterns were simple--for example if everyone had but one type of training--this approach would be straightforward. However, our examination of the data reveals a complex picture of training patterns which complicate the construction of a model to

capture the benefit to training. The number of possible combinations of training methods is too large to enter directly into the model.

To simplify the problem, we show below the training patterns which are possible, focusing most specifically on two types of training, high school vocational education and apprenticeship. Our diagrams are constructed to show the economic effects of two different training strategies: In the first, a young man acquires one and only one kind of training and receives a wage differential for his training compared to a young man who has no training. Shown by line "a" in the diagrams, this will be labelled the direct effect of training on subsequent wages.



Large numbers of men do not take route "a" but rather combine either high school vocational training or apprenticeship with

other training methods (route "b" in the diagrams, the indirect effect of a given training method on wages). We hypothesize that young men who take route "a" in either diagram will earn more subsequently than those who have no training. Furthermore, any of the routes "b" should result in even higher wages since we presume that the effects of training are cumulative.

Establishing a hierarchy of the various training possibilities results in a parsimonious set of variables to include in the regression model and isolates the combined effects of routes "a" and "b" for both apprenticeship and high school vocational education. In the first hierarchy shown below, any young man who had apprenticeship training is coded as an apprentice, regardless of whether he combined this training with some other kind:

Hierarchy 1

- 1) Apprentice
- 2) Company
- 3) Tech/Jr. College
- 4) Other
- 5) Military
- 6) High School

When entered in the model, the apprenticeship variable from Hierarchy 1 will thus capture both the benefits accruing to route "a" and the benefits from any potential route through "b." The second variable in the hierarchy, company training, is only attributed to a young man if he did not couple it with apprenticeship training. If company training is coupled with any other form of training, however, these indirect effects are

captured by the company training variable. Last in the hierarchy is high school vocational education. All indirect effects have been captured by the variables which preceded high school voc-ed in our hierarchy, leaving only the direct effect through "a" to be measured. We expect the direct effect to be positive.

To obtain a measure of both routes "a" and "b" for vocational education, we reverse the hierarchy, placing vocational training first. Thus anyone with high school vocational education is coded as having only high school training, regardless of whether this was combined with some other form of training. Placed last in Hierarchy 2 is apprenticeship training so that its direct effect alone can be measured. By comparing the estimates derived from Hierarchies 1 and 2, we can measure the added impact of multiple sources of training.¹³

The benefits to training by type (Table 12, Column 2) reveal that apprenticeship nets a very high wage advantage, 21 percent. The next highest benefit was only 8 percent, attributed

¹³For example, Hierarchy 1 could show that apprenticeship yielded a net wage advantage of 15 percent compared to men with no training. From Hierarchy 2, apprenticeships might show only a 10 percent wage advantage. Hierarchy 1 includes effects of both training routes a and b whereas Hierarchy 2 measures the effect of route a alone. Thus the combination of training patterns represented by route b adds about 5 percent to the net wage advantage in our example. These types of comparison are appropriate for voc-ed and apprenticeship since their positioning in the two hierarchies permits netting out the effects of routes a and b. Our methodology does, however, complicate the interpretation of the amount of extra benefit attributed to combinations of training occurring through route b. The extra 5 percent is a weighted average of all the possible training combinations. The weighting derives from the number of respondents taking various routes through b, each of which has its own benefit. Thus the exact additional benefit associated with all routes through b is affected by the composition of the sample.

to company training.¹⁴ Even when considering only its direct effects, high school vocational training yielded a net wage advantage of 7 percent, though the estimate was not as strongly significant as were those for company training and apprenticeship.

By including the indirect effects of high school training (Hierarchy 2) we found that the wage advantage relative to those with no training rose to 9 percent (Table 12, Column 3). Estimates based on Hierarchy 2 also raised the value and significance level for training which occurred in technical institutes, for other training, and for company training. Correspondingly, the value of apprenticeship training fell, when it was not coupled with other forms of training, from 21 percent to 17 percent.

Previous studies have not consistently demonstrated a significant return to vocational training in high school. Certainly, measuring the returns to training for craftsmen provides a good test since the occupation requires many of the skills taught in voc-ed programs.¹⁵ Recall that our sample is comprised of individuals who were craftsmen and that we exclude

¹⁴The estimate for military training, however, omits the wage benefit which occurs when combining military training with any training method other than high school voc-ed. Thus the 8 percent is not the full wage benefit which could be attributed to military training.

¹⁵See for example, John T. Grasso, "The Contributions of Vocational Education, Training, and Work Experience to the Early Career Achievements of Young Men." Ph.D. dissertation, The Ohio State University, 1975. One should note that by restricting the sample to craftsmen, we create the most liberal test for returns to voc-ed training. The lowest quality workers who took voc-ed but weren't successful in gaining a crafts position are excluded.

any effect that training may or may not have for mobility from crafts jobs to others. Also, the hierarchical ordering of training by type captures both direct and indirect effects of training, whose influence often operates through multiple sources. With this methodology, high school vocational training shows a positive return of from 7 to 9 percent when compared with informal training.

The benefits to formal training may be confounded by interactions with race and industry. The construction industry, with its long tradition of unionization and control over wages through apprenticeships, presents a potentially different case for measuring the wage advantage due to training. Conceivably, in this industry positive returns may stem solely from apprenticeship, an institutionalized form of informal on-the-job training. Our data do not completely support this view. Certainly apprenticeship training in construction produces very high benefits, 49 percent when compared to no formal training (Table 13).¹⁶ But even after accounting for apprenticeship training, men with training only in high school still showed higher wages than men trained informally, 15 percent higher.

In many ways, the construction industry represents a case where jobs and training for those jobs are not highly

¹⁶This very high wage advantage implicitly includes the effect of unionization, a variable which is not included in these regressions. The union variable is available in the NLS but only for employed men in selected years. When estimating the equations on a subsample of men for whom union status is known, we found that the return to apprenticeship training fell to 20 percent for men who worked in unionized construction industry jobs.

Table 13 Partial Results of OLS Estimated Wage Equations for Craftsmen in Construction
 Dependent Variable: Ln of Hourly Rate of Pay in 1976 Dollars
 (t-values)

Independent variables	Column 1	Column 2	Column 3
Any training	.238 (5.58)		
Training hierarchy 1 Apprentice training		.402 (7.35)	
Company training		.089 (0.82)	
Technical institute training		.184 (2.27)	
Other civilian training		.105 (1.50)	
Military training		.165 (1.51)	
High school training		.143 (1.76)	
Training hierarchy 2 High school training			.202 (3.22)
Military training			.095 (1.02)
Other civilian training			.190 (2.84)
Technical institute training			.303 (4.07)
Company training			.209 (1.87)
Apprentice training			.403 (4.74)
Black	-.119 (-1.91)	-.119 (-1.97)	-.106 (-1.70)
Dropout	-.079 (-1.48)	-.055 (-1.04)	-.076 (-1.42)
High school graduate Attended college	.157 (2.84)	.141 (2.60)	.128 (2.29)
R ² (adjusted)	.362	.390	.369
F-ratio	11.52	10.58	9.74
Standard error of estimation	.389	.380	.387
Sample size	390	390	390

intertwined. Substantial numbers of men with apprenticeship training never become craftsmen. Training received in technical institutes or high school, though by no means a perfect substitute for apprenticeships, does yield positive benefits. On the other hand, disproportionate numbers of individuals enter the industry with only informal training. What is unclear is whether they arrive with skills learned elsewhere or learn solely on the job. Without doubt they suffer a financial penalty for their lack of formal training.

Industries other than construction show quite a different picture. Training has positive benefits, but the 5 percent shown in Table 14 is far less than the 26 percent estimate we obtained for construction. Apprenticeship and company training may be the only significant types of training, unless the indirect effects of training in high school or in technical school are incorporated in the estimates for these two sources. In contrast to these training measures, wage benefits associated with formal education are highly significant: in general, having some college increases earnings 7 percent, and high school dropouts suffer a 12 percent penalty compared to graduates. These findings contrast with those for the construction industry, where dropouts on average had no different earnings than graduates. In industries other than construction, education could be serving as a screening device for potential craftsmen.

An even more likely screening characteristic is race. Does training differentially affect success among blacks or is the influence of race so pervasive that little differentiation is observed once race is controlled? Among blacks training does

Table 14 Partial Results of OLS Estimated Wage Equations for Craftsmen in Non-Construction Industries

Dependent Variable: Ln of Hourly Rate of Pay in 1976 Dollars

(t-values)

Independent variables	Column 1	Column 2	Column 3
Any training	.052 (2.34)		
Training hierarchy 1 ^a			
Apprentice training		.100 (3.18)	
Company training		.064 (1.97)	
Technical institute training		-.009 (-0.22)	
Other civilian training		.011 (0.31)	
Military training		.056 (1.09)	
High school training		.042 (0.99)	
Training hierarchy 2			.054
High school training			(1.80)
Military training			.053 (1.25)
Other civilian training			.012 (0.34)
Technical institute training			.077 (1.72)
Company training			.080 (2.17)
Apprentice training			.043 (0.87)
Black	-.056 (-1.99)	-.053 (-1.88)	-.056 (-1.97)
Dropout	-.112 (-4.26)	-.109 (-4.12)	-.109 (-4.08)
High school graduate	-	-	-
Attended college	.070 (2.40)	.070 (2.40)	.068 (2.32)
R ² (adjusted)	.374	.376	.372
F-ratio	26.91	22.29	21.98
S.E.E.	.314	.313	.314
Sample size	955	955	955

influence wage outcomes, yielding a 10 percent wage advantage for blacks with formal training (Table 15). Apprenticeship training does not show a significant return for blacks. White apprentices, on the other hand, showed a strongly significant wage differential over men with no formal training. The result stems from our inability to determine whether or not apprentices completed their training. For a sub-group of black respondents whose completion status is known, the benefit to apprenticeship training is strongly significant and shows a wage advantage which is as great or greater than that received by whites.¹⁷ High school voc-ed programs also yield a significant wage advantage for blacks (Table 15, Col. 2), but for whites, high school vocational education was significant only if its indirect effects were included in the estimates.¹⁸

Blacks, then, have been able to alter the mix of training sources to compensate partially for their severe disadvantage in apprenticeships. Our earlier descriptive statistics showed a

¹⁷The sample consists of 219 blacks who were still craftsmen as of 1978. In the 1978 interview respondents were asked if they had attained journeyman status following completion of an apprenticeship program. The regression results are available from the author on request.

¹⁸Regressions for blacks depart from the pattern we observed earlier in estimating wage models for other subgroups. The coefficient for high school training is stronger when only the direct effect is measured than it is when indirect effects are also included. Blacks who have multiple sources of training apparently experience a lesser return to their training than blacks who only have training in high school. This effect is plausible if blacks who are faced with employment difficulties enroll in multiple sources of training as a means of obtaining transfer income during periods of joblessness. In such a case the additional periods of training need not result in returns that are any higher than for blacks with only one source of training and subsequent employment success.

Table 15 Partial Results of OLS Estimated Wage Equations for Black Craftsmen
Dependent Variable: Ln of Hourly Rate of Pay in 1976 Dollars
(t-values)

Independent variables	Column 1	Column 2	Column 3
Any training	.095 (2.57)		
Training hierarchy 1			
Apprentice training		.081 (1.34)	
Company training		.121 (1.93)	
Technical institute training		.077 (1.04)	
Other civilian training		.037 (0.59)	
Military training		.171 (1.79)	
High school training		.143 (2.11)	
Training hierarchy 2			
High school training			.081 (1.57)
Military training			.201 (2.05)
Other civilian training			.071 (1.22)
Technical institute training			.069 (0.83)
Company training			.127 (1.72)
Apprentice training			.107 (1.33)
Dropout	-.068 (-1.64)	-.065 (-1.53)	-.070 (-1.64)
High school graduate	-	-	-
Attended college	.124 (1.99)	.121 (1.92)	.118 (1.87)
Construction	.037 (0.74)	.034 (0.66)	.035 (0.70)
Manufacturing	-	-	-
Other industries	-.134 (-3.18)	-.140 (-3.28)	-.133 (-3.13)
R ² (adjusted)	.328	.324	.322
F-ratio	8.55	7.02	6.97
S.E.E	.324	.325	.326
Sample size	341	341	341

much heavier reliance on high school or technical school training among blacks than among whites. The pattern suggests strong discrimination and some adjustment from blacks to the rationing of apprenticeship training slots.

Thus far little mention has been made of union status; regressions have been estimated excluding a union status variable. We have implicitly assumed that one of the benefits of training is to enhance the probability that a job will be secured in the higher paying unionized sectors of the crafts. But once union status is accounted for, does formal training further differentiate individual success? Not so, according to estimated equations for a subset of union and non-union craftsmen. Only apprenticeship and, to a lesser degree, company training have an impact on wages once union status is controlled (Table 16). This result is the same for blacks as for whites and for construction as well as non-construction industries. The value of other forms of training (such as high school vocational education) appears to come through an enhanced access to unionized jobs. Within the union or non-union sectors of the crafts, training has little measureable impact.

Summary Interpretation of the Data

Even in crafts occupations, a substantial proportion of young men obtain their skills through informal methods. Their participation in skilled manual training programs is certainly much greater than among those who do not become craftsmen; nevertheless, more than 40 percent in crafts positions did not report such training. An additional 30 percent of the young men

Table 16 Partial Results of OLS Estimated Wage Equations for Sub-sample of Craftsmen for Whom Union Status is Known
 Dependent Variable: Ln of Hourly Rate of Pay in 1976 Dollars
 (t-values)

Independent variables	Column 1	Column 2	Column 3
Union member	.300 (12.59)	.287 (12.25)	.296 (12.58)
Any training	.032 (1.42)		
Training hierarchy 1			
Apprentice training		.100 (3.36)	
Company training		.052 (1.52)	
Technical institute training		-.011 (-0.27)	
Other civilian training		-.029 (-0.81)	
Military training		-.015 (-0.27)	
High school training		-.006 (-0.15)	
Training hierarchy 2			
High school training			-.002 (-0.07)
Military training			.011 (0.26)
Other civilian training			.018 (0.50)
Technical institute training			.043 (1.08)
Company training			.065 (1.71)
Apprentice training			.120 (2.57)
Black	-.099 (-3.30)	-.093 (-3.09)	-.101 (-3.34)
Dropout	-.067 (-2.53)	-.056 (-2.10)	-.065 (-2.43)
High school graduate	-	-	-
Attended college	.088 (2.99)	.090 (3.04)	.084 (2.81)
R ² (adjusted)	.487	.493	.488
F-ratio	45.14	36.86	36.17
S.E.E	.306	.304	.305
Sample size	883	883	883

received training either through apprenticeship or company training, i.e., tied directly to the jobs they held; relatively few obtained training independent of work experience. Lester Thurow cites such evidence to support his view that skills are acquired for the most part on the job. According to Thurow, labor markets do not clear through wage reductions or shifts in relative wages: rather, employers ration training slots based on worker qualifications. Therefore understanding the process by which workers obtain their qualifications is an important step in the sociology of wage determination:

Upon examination, the basic assumptions about the labor market seem less than adequate. They ignore long-run employer-employee interests in a good mutual relationship.

They ignore the fact that much of our human capital is acquired on the job rather than in formal education. This can be seen in the analysis of the determinants of earnings or in the surveys of where working skills are acquired. The labor market is not primarily a market for allocating skills but a market for allocating training slots. Workers are only trained when job openings exist and an independent supply curve does not exist. But without independent supply and demand curves, wages must be determined in some fashion other than by a market correction....

Because skills are acquired on the job, in an informal process of one worker training another, every industrial operation needs workers willing to be trainers. To promote training and make workers willing to be trainers of other workers, employers essentially offer two guarantees. First, they promise not to lower wages if surplus workers become available. Second, they promise to hire and fire based on seniority. This means each trainer's trainees will be fired before he is....

Wages are set in a social process that is far removed from simple supply and demand curves in a modern industrial economy. From the employer's perspective this process is inefficient in that he cannot adjust wages to individual productivities and short-run changes in circumstances, but it is

efficient since his production team is not disrupted by dissatisfied workers, and since training occurs at less cost than it would otherwise. The gains from rigid wages are greater than the gains from flexible wages.

With downward rigidity in money wages and fixed relative wages, labor markets cannot clear via wage reductions and shifts in relative wages. They clear based on worker qualifications (level of education and so forth)....¹⁹

The analysis of differences between blacks and whites demonstrates the importance of the social process of wage determination for the crafts. More black craftsmen than white were trained informally, and even among those with formal training the sources differed by race. Blacks were less apt to have apprenticeship or other formal training offered through an employer. Instead, they relied more heavily on high school vocational education and government sponsored training to acquire their skills. Apprenticeship training yielded a high wage advantage for whites, but was not significant for blacks.

Military training can compensate for economic disadvantage in the social process of determining wages, but the link between training in the military and its utilization in the skilled crafts in the late 1960s and early 1970s was not strong, particularly for blacks. Our results could be of particular value as a benchmark for evaluating whether the transfer of military training to the civilian sector is now more effective.

Complicated patterns of skill acquisition reflect the complexity of social forces and individual choices that determine

¹⁹Lester Thurow, The Zero-Sum Society (New York: Basic Books,

whether a young man is adequately trained for his craft. As a consequence a model which measures the wage differentials associated with various kinds of training is also complex. Our modeling of the cumulative effects of training yielded significant results for high school vocational training. If coupled with any of the other training possibilities, young men gained a 9 percent subsequent wage advantage in the crafts jobs they held. Men who enrolled only in high school voc-ed programs, on the other hand, gained only a 7 percent subsequent wage advantage.

The rules of the wage determination process gain special significance when analyzing the benefits to training. A reanalysis of wage differentials in unionized and non-unionized settings shows that once union status is held constant, training other than company or apprenticeship no longer explains wage differentials in either sector. When unionization is controlled, the wage rates of craftsmen are more strongly related to the level of formal education than they are to vocational training acquired through schools.

Informal skills acquisition, which for many accompanies the process of wage determination stressed by Thurow, is the most intangible method of training examined here. Informal methods occur more predominately in construction and are more heavily relied upon by blacks. Characterizing the informal methods was difficult, however, despite the rich file of longitudinal data we used. We found some evidence that skills were acquired in farming or previous technical jobs, but on the whole few clues were produced to specify the sources of informal training.

Regardless of how the skills were acquired, our analysis confirms the quite different wage outcomes associated with informal vs. formal training routes. Formal training yields a substantial wage benefit for those who obtain it.

Policy implications of the social processes affecting wages include continued support for training methods which compensate for blacks' low participation in apprenticeship programs. More attention should be paid to the manufacturing sector where blacks' disproportionately low utilization of apprenticeship was not compensated by higher rates of participation offered through vocational education or other sources such as government programs.

Bibliography

- Foster, Howard G. "Nonapprentice Sources of Training in Construction," Monthly Labor Review, Vol. 93, No. 2 (February, 1970), pp. 21-26.
- Horowitz, Morris A. and Herrnstadt, Irwin L. "The Training and Education of Tool and Die Makers." In Proceedings of the Twentieth Annual Winter Meeting of the Industrial Relations Research Association (Washington, D.C., December 28-29, 1967). Madison, Wisconsin: Industrial Relations Research Association, 1968, pp. 15-24.
- Marshall, Ray and Glover, Bob, Training and Entry into Union Construction, Manpower Research and Development Monograph 34, U.S. Department of Labor, Washington, D.C.: U.S. Government Printing Office, 1975.
- National Manpower Council, Policy for Skilled Manpower, Columbia University Press, 1954.
- Thurow, Lester. The Zero Sum Society, New York: Basic Books, 1980.
- U.S. Department of Labor, Manpower Administration, Formal Occupational Training of Adult Workers, Manpower Research Monograph, No. 2, Washington, D.C.: U.S. Government Printing Office, December, 1964.